ENT SENIOR DESIGN PROJECT REPORT

Smart Seat Car Seat

Submitted to

Professor Elaine Cooney
Engineering Technology Department
by
Donte Sims, Evan Hall, & Houssainatou Diallo

March 25, 2021

Smart Seat Car Seat

EXECUTIVE SUMMARY

A solution to children being left and forgotten in their car seats while parents/guardians take a brief step away from the vehicle with the intent of returning shortly. The Smart Seat uses a temperature sensor to keep track of the interior temperature of the vehicle, an occupancy sensor to detect front seat presence for childcare, 2 force sensitive resistors (FSR) to detect child presence in the car seat, and a strobe light to alert the public when limits have been exceeded that a child has been left unattended. A raspberry pi is used as the brains of the operation. It has a feature to send text messages to the owner's cell phone regarding child safety and to alert authorities.

This product meets the sponsors need which is simply to assist with the prevention of a child being forgotten in the vehicle unattended. An uninterruptable power supply (UPS) was developed and integrated into the system to ensure that the system works with vehicles whose power to the cigarette lighter is lost when the vehicle is turned off per sponsor/faculty recommendations. Upon testing, our team was successful with transmitting messages to the cell phone containing onboard logistics to the owner, contacting the authorities, and controlling the peripheral devices.

Smart Seat Car Seat

TABLE OF CONTENTS

Smart Seat Car Seat

REVISION HISTORY

Version	Date	Revised by	Description
1.0	25 March 2021	Donte Sims	Initial version
2.0	20 April 2021	Donte Sims	Revisions for Final Draft

Smart Seat Car Seat

INTRODCTION

Needs Statement:

Parents/Guardians need a way to be informed when they have left something in their vehicle. More importantly they need to be informed when they have unknowingly left a child inside their vehicles. Often times people tend to think that they will be able to run in and out of a business to take care of a minimal time-consuming activity. In most cases, poor judgement of time is exhibited, and people become occupied, possibly forgetting that they have a child in the car. When this happens, parents/guardians need a reminder. In the current state of children's car seats, there is not a way for parents to determine the well-being of their children in the car.

Objective Statement:

The objective of this project is to create a safety car seat system to assist with children being left in vehicles unattended. By means of system integration the car seat will provide diagnostics of the inside of the vehicle. Some on board functionalities of the system will be to include a means for temperature measurement, child presence, driver presence, and wireless communication with the parent/guardian via cell phone. Through these system integrations, the smart seat will be able to notify parents/guardians or keyholders that a child has been left in the vehicle and needs to be tended to.

Customer Requirements:

Our key customer's will require some, but not all the following:

- Safety for children
- Wireless Communication
- Easy Functionality
- On-board logistics data for system (temperature, occupancy presence of driver, and child presence in Smart Seat)

Out of Scope Work

- Bluetooth functionality and Bluetooth components
- Visual/Image display through wireless communication
- Audio communication
- Auto reset of system alarm

Smart Seat Car Seat

Current Market Outlook:

The current market does not offer public notification that a child has been left in the vehicle. There are currently systems that alert the parent/guardian that a child has been left in the vehicle through wireless communication to their phone. However, there is not a system that integrates with the vehicle and allows for public notification should the parent/guardian not be able to get to the vehicle quickly enough.

Our product will be more useful to customers by first sending notification to the parent/guardian and giving them the opportunity to get back to the child. Should the parent/guardian not be able to get to the child quickly enough, our product will flash strobe lights.

Smart Seat Car Seat

SPECIFICATION REQUIREMENTS

Customer Specifications:

- Temperature should be read and used to identify a comfort zone of 68-76 degrees with a tolerance of +/- 5 degrees
- Weight is to be used to determine presence of a child in the seat and should report a boolean true reading if the weight is greater than 4lbs
- An occupancy sensor should be used to test for driver presence inside vehicle; if driver presence is detected the rest of the system will be deactivated to save system power
- Wireless communication system will work at a minimum of 15ft.
- System will be powered using the following:
    - 12V power of vehicle, 5V USB connection, and uninterruptible power supply
- Final runtime will be determined on choice of power source
- Controller should not exceed 12” x 12”
- Cost of prototype will not exceed $250
- Customer cost of end-product shall not exceed $250 + tax
- Components (sensors) should not exceed $80 + tax

Engineering Specifications:

- Temperature Sensor (range)
    - 0C-45C
- Occupancy Sensor (range)
    - 5ft
- Load Cell (range)
    - 0-2kg

Smart Seat Car Seat

LOW LEVEL DESIGN (INCLUDES HIGH LEVEL DESIGN INFORMATION)

System- Wide Design Decisions

Choice of a Microcontroller:

The main element for the design of the smart seat for this project is a microcontroller. Thus, its choice is very important. Below is a data analysis table of five different types of microcontrollers.

Table 1: Total Score= sum of X values times Scaled number.

Project Goal: Find the best microcontroller for our project	A scale of 1 through 5 is used to ranked each item					
	Fair		Good		Best	
	1	2	3	4	5	
Microcontroller Type	Memory	Processor	ports/ connectivity	Cost	USB	Total
Weighted criteria	7	9	10	8	6	Score
Raspberry Pi 4 model B	5	5	5	5	4	194
Raspberry Pi 3 model B+	4	5	3	3	5	157
Arduino Uno R3	2	4	2	1	3	96
Teensy 4.0	1	5	3	2	4	122
Arduino pro mini 328	3	3	1	4	1	96

As seen in the above table above, the raspberry pi 4 scored the highest. So that would be what the team would use for the project. Also, one of our team members already has it and has proposed that we will use it at no cost.

Smart Seat Car Seat

Choice of an occupancy sensor:
A scale of 1-5 is used to rank each item in the following table, the sensor with the highest score would be the best choice. As it will exceed all the other sensors when compared to the different defined category. Thus, in this case the Leviton OSSMT-GDW would be the best choice.

Table 2: Total Score= sum of X values times Scaled number.

	Fair		Good		Best	
	1	2	3	4	5	
Occupancy sensors type	Coverage	Time Delay	Field view	Motion Detection	Cost	
Weighted Criteria	6	9	10	8	7	Total Score
Leviton OSSMT-GDW	5	4	4	5	1	153
Enerlites MPC-50H-W	2	5	5	4	4	167
Intermatic IOS-DSIMF-WH	3	5	3	4	5	160
Lutron LRF2-OWLB-P-WH	1	4	4	4	2	128
Lutron Maestro MSCL-OP153M-WH	4	3	4	4	3	144

Smart Seat Car Seat

Choice of a Presence sensor:

Table 3: Total Score= sum of X values times Scaled number.

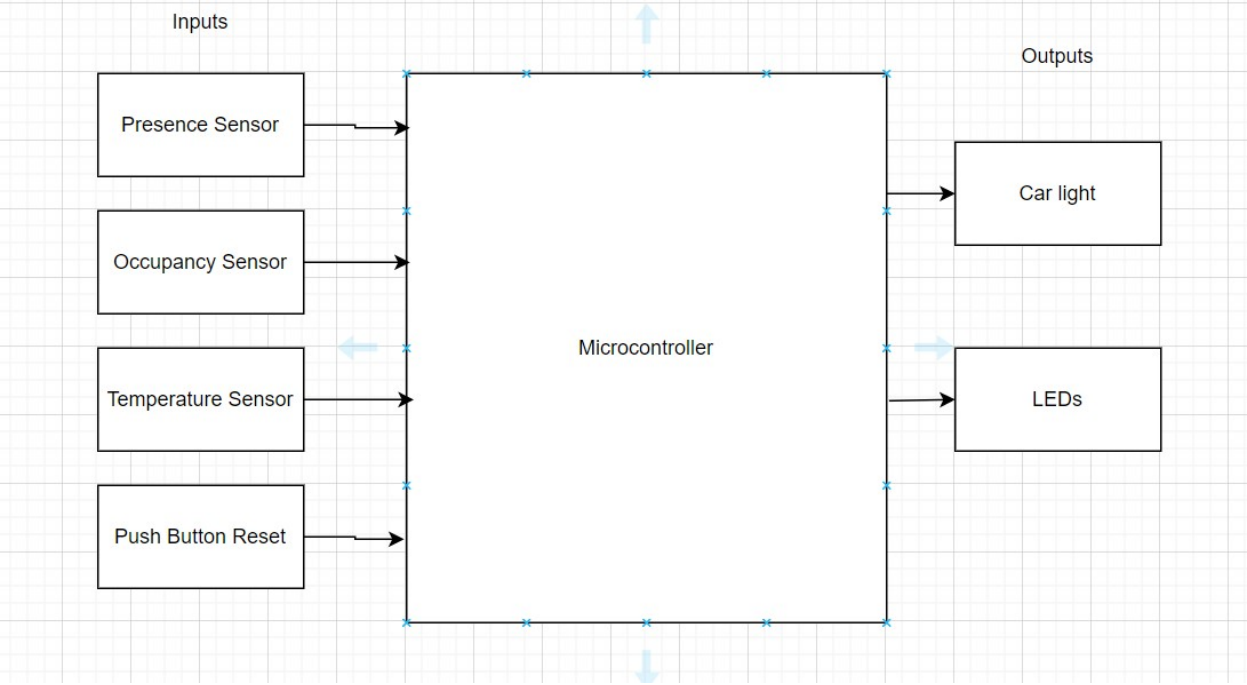
	Fair		Good		Best	
	1	2	3	4	5	
Presence Sensor type	Operation Temperature	output Voltage	Human Presence detect range	Output Resolution	Cost	Total score
weighted Criteria	10	7	9	6	8	
IRA-S230ST01	3	2	5	3	4	139
AK9753	4	3	2	3	2	113
AK9750	4	5	4	3	3	153
TSSP930	5	4	3	1	5	151

A scale 1-5 is used to rank each item in the above table, the sensor with the highest score would be the best choice. As it will exceed all the other sensors when compared to the different defined category. Thus, IRA-S230ST01 would be the best choice.

Smart Seat Car Seat

4. System Architectural Design

4.1 System Components



Everything in this block diagram is centered around the micro controller. Since the micro controller is the brain of our experiment it is the biggest and needs to be the focal point. The Presence Sensor, Occupancy Sensor, Temperature Sensor, and Wireless Key Fob Connector need to go into the input side of the micro controller. On the output comes the car lights and the key fob.

Smart Seat Car Seat

4.2 Concept of Execution

First, we need to see if the child is present because that determines if the code will function or not. Next, we need to see if the Temperature is above a certain degree level to determine if the child is in danger. Afterwards, we need to see if the parent is there or not to determine if the child could possibly die. If all those things line up for the worst conditions for the child, we issue a warning to the user's phone to make sure that the parent knows what is going on. After a certain amount of time, another warning is issued to give the parent a bit more time to save the child and get them out of the car. Finally, if the parent does not respond to the warnings given to them by the phone, we issue an alert to the police and start flashing the lights while giving the parent/guardian a notification. A visual breakdown of this can be observed in the image under item 7, Detailed User Interface.

4.3 Interface Design

The user will be able to see the physical key fob that will be used as a first response of the system to inform the user that a child has been left unattended in the vehicle. This will be an automated interaction between the Smart Seat and user. While the temperature sensor and occupancy sensor may be visible by the user, these are not input components that the user will be able to engage. Lastly, there will be a presence sensor to determine whether a child is present in the Smart Seat. This will not be visible to the user and will simply be an automated response to the microcontroller based on if a child is placed in the seat or not.

5.1 *Sub Assembly 1* Schematic & operation

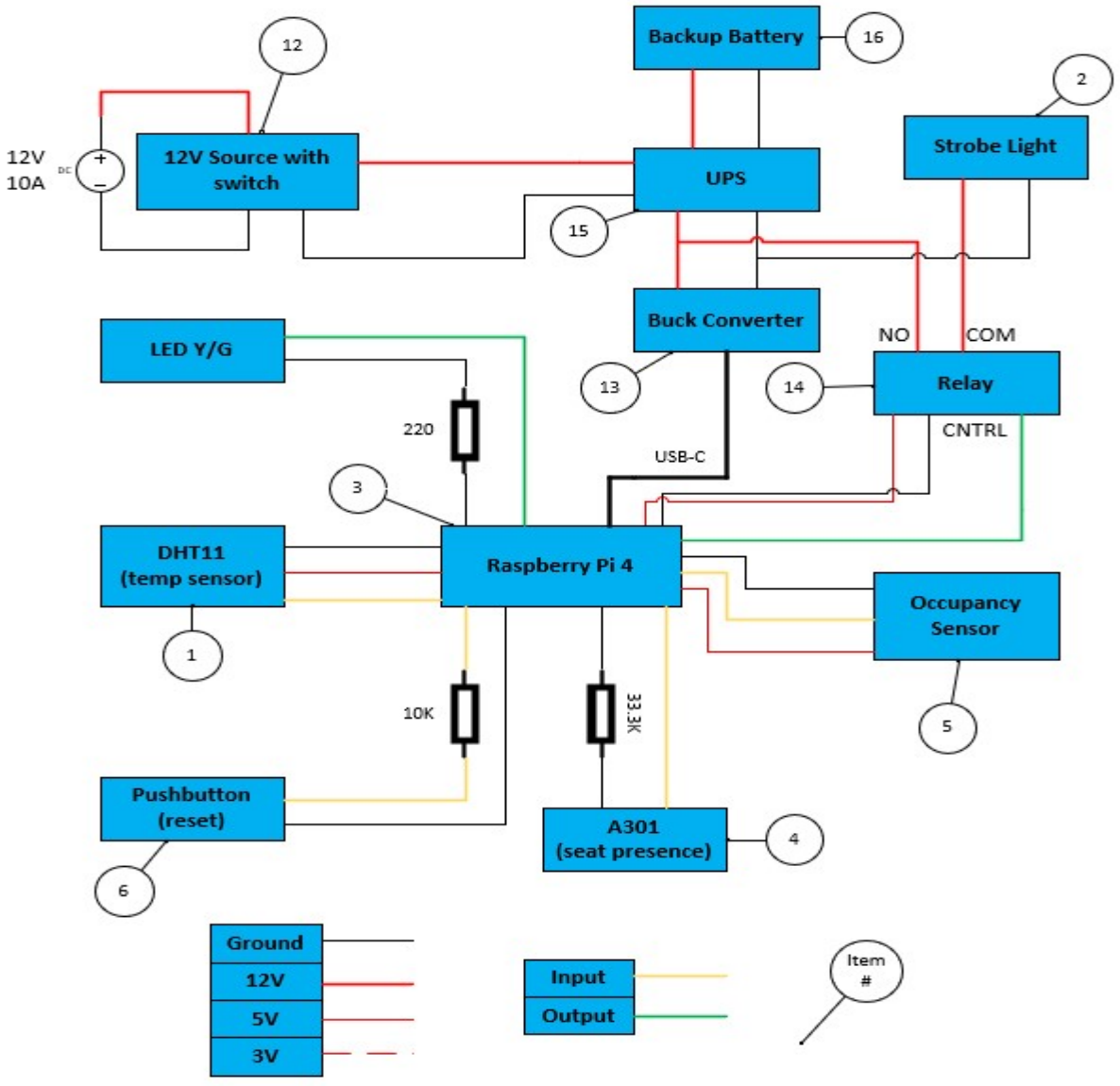
PIN OUT

I/O Map			
Inputs		***Outputs***	
FSR Pad 1	GPIO 4	Baby FSR LED	GPIO 5
FSR Pad 2	GPIO 14	Temperature LED	GPIO 6
Temperature Sensor	GPIO 17	Relay Signal	GPIO 13
Occupancy Sensor	GPIO 27		
Reset Button	GPIO 15		

The table avobe is a break down of the inputs and outputs for the components used to communicate with the raspberry pi. The GPIO pins should be notated and referenced as these numbers are not the actual pin numbers.

Smart Seat Car Seat

5.2 System Assembly



The above figure displays the wiring for the Smart Seat Car Seat. There is a legend that indicates what the line color/thickness indicates for usage. Please keep in mind that the wiring colors of the prototype may vary from that of the above figure. The item numbers can be reference to the bill of materials for manufacturer information and pricing.

Smart Seat Car Seat

Bill of Materials

Smart Seat Car Seat

ITEM NO.	MFR Name / PART NO.	Part No.	QTY.	DESCRIPTION	COST
1	Velleman	2245415	1	Temperature and Humidity Sensor (FTC Block DHT11)	$ 6.49
2	DT Moto	B075KZJW5Z	1	Strobe Light	$ 18.95
3	Adafruit	4295	1	Raspberry Pi 4 (ALREADY HAVE, DO NOT ORDER)	$ -
4	Pololu	1645	2	Pololu - Force-Sensing Resistor: 1.5" Square	$ 19.90
5	Parallax	2082927	1	PIR Motion Sensor	$ 14.95
6	Judco Manufacturing	22218	1	PUSHBUTTON	$ 1.75
7	IUPUI	N/A	1	18/2 red and black wire (100 ft.)	$ -
8	IUPUI	N/A	1	18/2 white wire (100 ft.)	$ -
9	Cinch Connectors	231036	4	Connector Barrier Strip 8 Postion	$ 17.00
10	Poly Case	DC-59PMMTG	1	Gasketed Heavy Duty Enclosure w/screws	$ 18.01
11	Jameco Valuepro	419160	2	4ft. Of Black 1/8 Inch Polyolefin Heat Shrink Tubing	$ 2.50
12	Ultra Bright Lightz	CLPDP	1	12V male plug cigarette lighter adapter, 10A on/off switch cord w/fuse and 1.5m cable	$ 14.99
13	Konnected		1	12V to 5VDC USB-C buck converter	$ 11.99
14	Songle	SRD-05VDC-SL-C	1	5V .Relay	$ 5.98
15	PicoUps	120-ATV	1	Uinterruptable Power Supply	$ 35.00
16	Mighty Max		1	12V 5A SLA Battery	$ 15.79
17	Graco		1	Car Seat (PROVIDED BY PHIL PASH)	$ -
				TOTAL	$ 183.30
				Taxes	$12.83
				Final Total	$196.13

Smart Seat Car Seat

6. Detailed Software Design

6.1 Main Program

```
from gpiozero import MotionSensor
from twilio.rest import Client
import time
import RPi.GPIO as GPIO
import Adafruit_DHT
import os
import sys

#twilio info for the phone
account_sid = "AC4b8ba18913af07d3d3465bd2002b1635"
auth_token = "c86b6666b6d2a5a626e218d88580d361"
client = Client(account_sid,auth_token)

#setup for the Force Senstive Resistor
GPIO.setmode(GPIO.BCM)
GPIO.setup(4,GPIO.IN)
GPIO.setup(14,GPIO.IN)

#setup for the push button
GPIO.setmode(GPIO.BCM)
GPIO.setup(15,GPIO.IN)

#setup for the relay
GPIO.setmode(GPIO.BCM)
GPIO.setup(13,GPIO.OUT)

#setup for the LEDs
GPIO.setmode(GPIO.BCM)
GPIO.setup(5,GPIO.OUT)
GPIO.setup(6,GPIO.OUT)

#setup for the occupancy Sensor
pir = MotionSensor(27)

#setup for Temp Sensor
sensor = Adafruit_DHT.DHT11
gpio = 17
humidity,temperature = Adafruit_DHT.read_retry(sensor,gpio)
```

Smart Seat Car Seat

```
temp_reading = (temperature * 1.8) + 32
tempWait = 0

#function for the message to send
def sendMessage(warningNumber, currentTemp):

        message = client.api.account.messages.create(
        to = "+13173855007",
        from_ ="+18104208614",
        body = "Warning number "+ str(warningNumber) + " at " + str(currentTemp))


def fsr_reading(fsr_pad):

        if(fsr_pad == 0):
                GPIO.output(5,GPIO.HIGH)
                time.sleep(0.1)
        else:
                GPIO.output(5,GPIO.LOW)
                time.sleep(0.1)

def temp_sensor(temp_sense):

        if(temp_sense > 0):
                GPIO.output(6,GPIO.HIGH)
                time.sleep(0.1)
        else:
                GPIO.output(6,GPIO.LOW)
                time.sleep(0.1)
#changes the warning period if the temperature is above or below a certain threshhold
if(temp_reading > 72 or temp_reading < 55 ):
        tempWait = 7
else:
        tempWait = 10

timer = 0
warning = 1
GPIO.output(13,False)
while True:
#changes the warning period if the temperature is above or below a certain threshhold
if(temp_reading > 72 or temp_reading < 55 ):
        tempWait = 7
else:
        tempWait = 10

timer = 0
warning = 1
GPIO.output(13,False)
while True:

        baby_checker = 6
        temp_checker = 5
        pressurePad = GPIO.input(14)
        pressurePad2 = GPIO.input(4)
        pushButton = GPIO.input(15)

        #no motion, pressure pad activated, no warning
        if((pressurePad2 == 0 or pressurePad == 0) and pir.wait_for_no_motion() and timer >= tempWait and warning == 1):

                #send message to phone, first warning
                sendMessage(warning, temp_reading)
                warning += 1
                print(warning)
                timer = 0
                fsr_reading(pressurePad2)
                temp_sensor(temp_reading)
```

Smart Seat Car Seat

```
#no motion, pressure pad activated, no warning
if((pressurePad2 == 0 or pressurePad == 0) and pir.wait_for_no_motion() and timer >= tempWait and warning == 1):

        #send message to phone, first warning
        sendMessage(warning, temp_reading)
        warning += 1
        print(warning)
        timer = 0
        fsr_reading(pressurePad2)
        temp_sensor(temp_reading)


#no motion, pressure pad activated, 1 warning
elif((pressurePad2 == 0 or pressurePad == 0)  and pir.wait_for_no_motion() and timer >= tempWait and warning == 2):

        #send message to phone, second warning
        sendMessage(warning, temp_reading)
        warning += 1
        print(warning)
        timer = 0
        fsr_reading(pressurePad2)
        temp_sensor(temp_reading)


  #no motion, pressure pad activated,final warning
  elif((pressurePad2 == 0 or pressurePad == 0) and pir.wait_for_no_motion() and timer >= tempWait and warning == 4):

          #send message to the authorities
          message=client.api.account.messages.create(
          to = "+13173855007",
          from_ = "+18104208614",
          body = "Setting off Emergency Lights")
          warning += 1
          print(warning)
          GPIO.output(13,True)
          print("flashing Lights")
          time.sleep(1)
          fsr_reading(pressurePad2)
          temp_sensor(temp_reading)

          while(pushButton == 0):

                  GPIO.output(13,False)
                  print("no flashing lights")
                  fsr_reading(pressurePad2)
                  temp_sensor(temp_reading)
                  warning = 0
                  time.sleep(5)

    elif(pressurePad2 == 1 and timer == 20):

            timer = 0
    #while anything else is happening
    else:
            print(timer)
            print(pressurePad2)
            print(warning)
            print("maybe baby")
            print(pushButton)
            timer = timer+1
            time.sleep(1)
            fsr_reading(pressurePad2)
            temp_sensor(temp_reading)
```

Smart Seat Car Seat

6.1 Subroutine1

SEE MAIN CODE

6.2 Variables

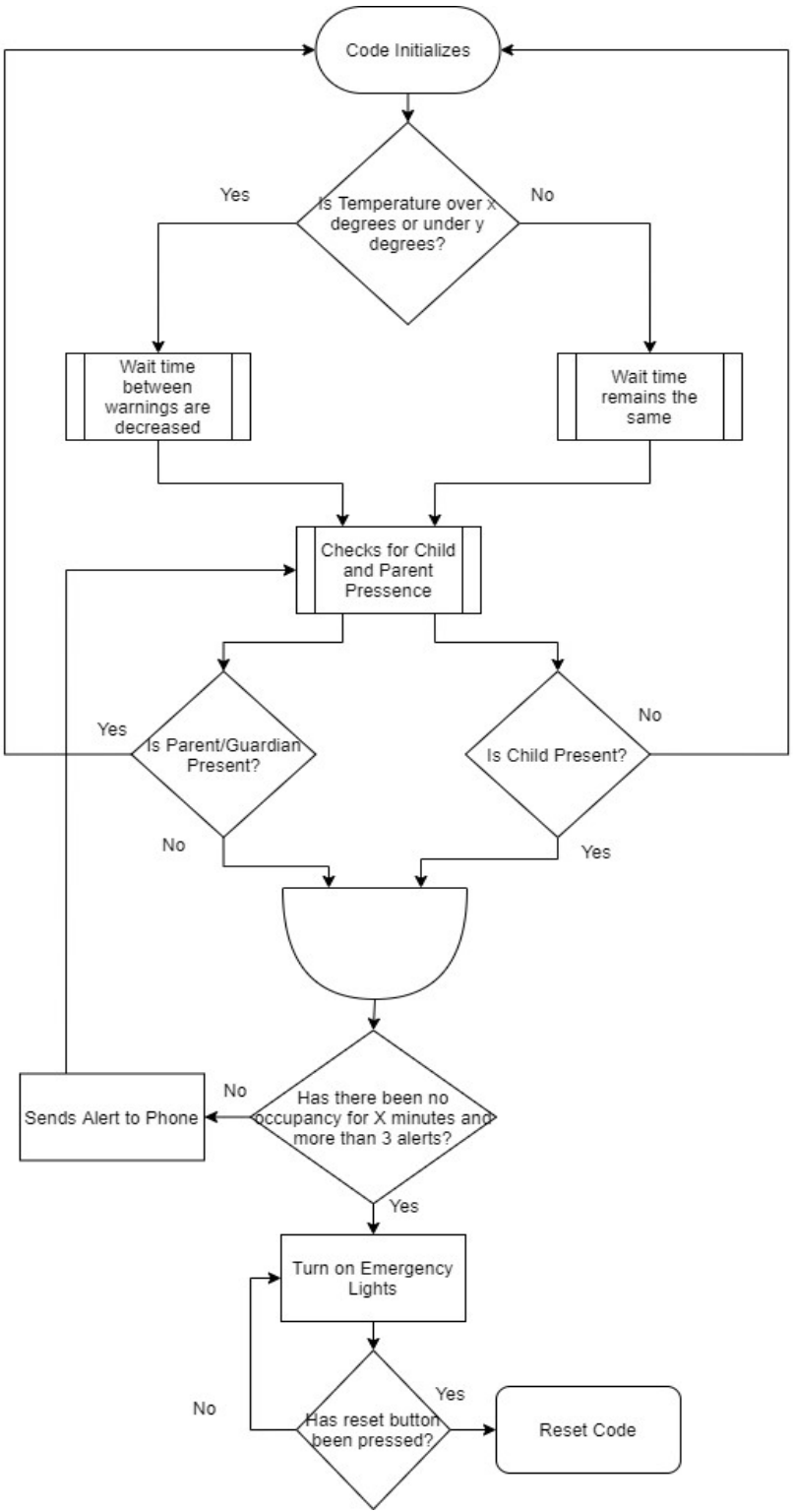
Temperature Sensor (Integer) – TempSens – current temperature
Presence Sensor (Bool) – ChildSens – Detects If child is present
Parent Sens (Bool) – ParentSens - determines if Parent is there
Wireless Key fob (Bool) – KeyFobButton – Tells if the key fob button has been pressed
Lights Flash (Bool) – Lights – Determines state of lights
Warning (Int) – Warnings – Number of Alerts Person is allowed
Clock (Timer) – Clock – Timer for the alerts

6.3 I/O Assignments

Temperature Sensor (Integer)– current temperature
Presence Sensor (Bool) – Detects If child is present
Parent Sens (Bool) - determines if Parent is there
Wireless Key fob (Bool) - Tells if the key fob button has been pressed
Lights Flash (Bool) - Determines state of lights
Warning (Int) - Number of Alerts Person is allowed
Clock (Timer) -Timer for the alerts

Smart Seat Car Seat

7. Detailed User Interface



Smart Seat Car Seat

Test Plan Introduction

This document outlines the necessary tasks to ensure that the Smart Seat components are working correctly. Items necessary to be tested as well as parts needed for testing will be explained. If carried out correctly and all systems pass the tests, the Smart Seat system should function properly.

Required Components

To test the system, all parts of the system must be correctly setup. Here is a list of the necessary components that shall be used to test the Smart Seat System:

- Temperature Sensor
  - Obtains temperature of inside of vehicle
- Occupancy Sensor
  - Determines if Driver/Front Passenger is present
- Seat Presence Sensor
  - Installed in seat of car seat to determine if child is present in seat
- Strobe Light
  - Integrated into system for public awareness that child needs assistance
- Car Seat
  - Primary base of the system and maintains child safety while child is in vehicle
- Pushbutton and Switch
  - Pushbutton used to reset system after system has been activated
  - Switch used to power on/off system
- Led (green/yellow)
  - Indicates that sensors are active
    - Yellow – temperature sensor
    - Green – seat presence sensor
    - Red – driver/front passenger occupant sensor
- Pre-programmed Microcontroller
  - Sends and receives signals to components of the Smart Seat System

Smart Seat Car Seat

Hardware Setup **Refer to wiring diagrams for hardwire setup*

Component	Input/Output	Instruction
Temperature Sensor	Input	Mount to car seat in location inaccessible to child and hardwired to microcontroller
Occupancy Sensor	Input	Mount in front seat area and hardwire to microcontroller;
Seat Presence Sensor	Input	Mount under cushion of base of car seat (also 1 on back of base) and hardwire to microcontroller
Pushbutton	Input	Mount in easily accessible area (to user) for reset of the system, but out of reach of child; hardwire to microcontroller
Switch	Input (Power)	Connects to cigarette lighter and hardwire to microcontroller
Led	Output	Mount LED array in easily visible area on car seat and hardwire to microcontroller
Strobe light	Output	Hardwire to microcontroller (mounted in rear/front window)
Uninterruptable Power Supply		Connect in parallel with main power source
Car Seat		Mount securely to back seat; refer to car seat manufacturer installation instructions for proper installation
Microcontroller		Mount in dry area away from moving items

Smart Seat Car Seat

TEST PLAN

Testing the Smart Seat System

Note: Always turn off power when verifying wiring and/or rewiring any component of the system.

1. Power system on using switch. If system powers properly, the led lights should flash 3 times upon power up. If lights do not flash, troubleshoot power. Verify that batteries are properly charged and that the power system switch is correctly wired to the microcontroller. If lights still do not flash, verify that the led lights are properly wired and repeat test.
2. Pushbutton- pressing the pushbutton should reset the system. System reset can be visually observed by flashing in a 3, 2, 1 pattern. If the reset pattern does not initiate this is indication that the system is not functioning properly and could potentially cause the led lights to flash at unwanted intervals. Power off the system, verify proper wiring, and retry.
3. Seat presence sensor- apply pressure to the sensor to activate the green led. This indicates that the sensor is working properly. If the led does not light when the sensor has pressure applied, inspect the sensor for damage. Once the component is verified undamaged, verify proper wiring was observed. Test the sensor again.
4. Temperature Sensor- if functioning properly the red led sensor will be lit. Should the red led not be lit, this is indication that the temperature sensor is not receiving a reading. Wiring should be verified before continuing the test. Temperature output should be within 5 degrees of real-world temperature compared to weather.com.
5. Occupancy Sensor- Because the occupancy sensor detects movement, start by waving your hand or an item near or around the sensor. So long as the sensor is functioning properly and a presence is detected, the red led shall be lit. If the yellow led is not lit, this is indication that the sensor is not reading movement. Verify proper wiring and retest.
6. Pull main power source (cigarette lighter switch) and repeat steps 1-6. During this test, the system will be functioning using the backup battery.
7. Once all tests have passed, the system is ready for use.

Smart Seat Car Seat

Test Plan Evaluation

STEP	TEST PERFORMED (Y/N)	PASS/FAIL	NOTES
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Smart Seat Car Seat

RECOMMENDATIONS

While this system can be used with any vehicle, it is recommended that the system only be used with vehicle cigarette lighter outlets that are fused for 10 amps or less. This is because vehicle cigarette lighter amperage can vary from as low as 5 amps up to 20 amps. Consumers should refer to the owner's manual of his/her vehicle to determine what it is fused for. Individuals who choose to change the fuse size to accommodate the 10-amp rated system or use the system with a cigarette lighter outlet fused higher than 10 amps do so at their own risk.

NOTES

Customer's Roles & Responsibilities

The customer is responsible for safely mounting car seat into vehicle. It is expected that the customer will adhere to all public driving laws. Customer responsible for correctly securing child inside car seat. It is assumed that the customer will respond to the alerts given by this product; immediate response to alert from system is highly advised. Customer is responsible for maintaining system for proper functionality. It is also assumed that the customer will not use this device to intentionally leave his/her child in the vehicle while unattended. Customer assumes all responsibility for all consequences that may arise due to the child being left unattended.

Smart Seat Car Seat

Risk Analysis

- Can the child disconnect wiring while in the seat?
  - While it is not impossible, it is highly unlikely. The wiring is concealed under the cushion and make connections as well as the enclosure are mounted on the rear of the car seat.
- Is there enough wire for the occupancy sensor to be mounted wherever a consumer would want to mount it; what about the 3-wire setup becoming tangled?
  - Yes. The occupancy is provided with 10ft of wiring that is wrapped to avoid wire tangles and snags.
- How difficult is it to see whether the system components are working? Does a consumer have ease of access to visual aids and pushbutton for reset?
  - The occupancy sensor has a red internal led that lights up when movement is detected. There is a green led, yellow led, and pushbutton mounted on the passenger side of the rear facing car seat. This allows users to easily see the led lights to verify component operation as well as easily push the reset pushbutton.
- Why not use a Bluetooth PIR sensor?
  - A hardwired sensor means there is no need for battery placement and there is no potential for connectivity issues.

- What if the child moves around in the seat?
  - There are 2 FSR sensors for seat presence. One is located on the backing and one on the bottom where the child's bottom sits.
- What if the user decides to quickly disconnect the wiring harness to avoid text alerts and the lights going off?
  - Our wiring harness used takes a good bit of effort to disconnect as to deter this action. This also makes it very difficult for a child to disconnect the system should the child be able to access the wiring harness. A parent would be less likely to disconnect the wire harness as it would not be a quick action.

Smart Seat Car Seat

- What if the vehicle is turned off for an extended period? Will the system shut down and not work with the cigarette lighter no longer active?
    - No, the Smart Seat Car Seat utilizes a UPS that charges a 12V 5Amp Hour battery while the cigarette lighter is in use. When the cigarette lighter power discontinues, the system automatically switches over to the backup battery; with the system using roughly 1.33 amps, the battery can maintain the Smart Seat Car Seat for about 3.76 hours.
- What happens if a wire becomes disconnected?
    - All wiring in the system was soldered and heat-shrink installed to avoid shorts, disconnects, and electrocution.

Smart Seat Car Seat

References

https://www.circuitbasics.com/how-to-set-up-the-dht11-humidity-sensor-on-the-raspberry-pi/

https://projects.raspberrypi.org/en/projects/physical-computing/11

https://pimylifeup.com/raspberry-pi-pressure-pad/

https://www.electronicshub.org/control-a-relay-using-raspberry-pi/

https://www.youtube.com/watch?v=Oi37Ig_ciJ8&ab_channel=AlexanderBaran-Harper

https://www.raspberrypi.org/documentation/usage/gpio/

https://www.ics.com/blog/control-raspberry-pi-gpio-pins-python

Standards

GSM: for cellular communication
UL2089: for vehicle cigarette lighter plugs

Smart Seat Car Seat

APPENDIXES

Final Project Specification (Signed)

Needs Statement:

Parents/Guardians need a way to be informed when they have left something in their vehicle. More importantly they need to be informed when they have unknowingly left a child inside their vehicles. Often people tend to think that they will be able to run in and out of a business to take care of a minimal time-consuming activity. In most cases, poor judgement of time is exhibited, and people become occupied, possibly forgetting that they have a child in the car. When this happens, parents/guardians need a reminder. In the current state of children's car seats, there is not a way for parents to determine the well-being of their children in the car.

Objective Statement:

The objective of this project is to create a safety car seat system to assist with children being left in vehicles unattended. By means of system integration the car seat will provide diagnostics of the inside of the vehicle. Some on board functionalities of the system will be to include a means for temperature measurement, child presence, driver presence, and wireless communication with the parent/guardian via cell phone. Through these system integrations, the smart seat will be able to notify parents/guardians or keyholders that a child has been left in the vehicle and needs to be tended to.

Customer Requirements:

Our key customer's will require some, but not all of the following:

- Safety for children
- Wireless Communication
- Easy Functionality
- On-board logistics data for system (temperature, occupancy presence of driver, and child presence in Smart Seat)

Current Market Outlook:

The current market does not offer public notification that a child has been left in the vehicle. There are currently systems that alert the parent/guardian that a child has been left in the vehicle through wireless communication to their phone. However, there is not a system that integrates with the vehicle and allows for public notification should the parent/guardian not be able to get to the vehicle quickly enough.

Our product will be more useful to customers by first sending notification to the parent/guardian and giving them the opportunity to get back to the child. Should the parent/guardian not be able to get to the child quickly enough, our product will flash strobe lights.

Smart Seat Car Seat

Customer Specifications:

- Temperature should be read and used to identify a comfort zone of 68-76 degrees with a tolerance of +/- 5 degrees
- Weight is to be used to determine presence of a child in the seat and should report a boolean true reading if the weight is greater than 4lbs
- An occupancy sensor should be used to test for driver presence inside vehicle; if driver presence is detected the rest of the system will be deactivated to save system power
- Wireless communication system will work at a minimum of 15ft.
- System will be powered using the following:
    - 12V power of vehicle, 5V USB connection, and uninterruptible power supply
- Final runtime will be determined on choice of power source
- Controller should not exceed 12” x 12”
- Cost of prototype will not exceed $250
- Customer cost of end-product shall not exceed $250 + tax
- Components (sensors) should not exceed $80 + tax

Engineering Specifications:

- Temperature Sensor (range)
    - 0C-45C
- Occupancy Sensor (range)
    - 5ft
- Load Cell (range)
    - 0-2kg

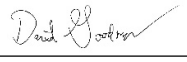
Smart Seat Car Seat

Out of Scope Work

- Bluetooth functionality and Bluetooth components
- Visual/Image display through wireless communication
- Audio communication
- Auto reset of system alarm

Customer's Roles & Responsibilities

The customer is responsible for safely mounting car seat into vehicle. It is expected that the customer will adhere to all public driving laws. Customer responsible for correctly securing child inside car seat. It is assumed that the customer will respond to the alerts given by this product; immediate response to alert from system is highly advised. Customer is responsible for maintaining system for proper functionality. It is also assumed that the customer will not use this device to intentionally leave his/her child in the vehicle while unattended. Customer assumes all responsibility for all consequences that may arise due to the child being left unattended.

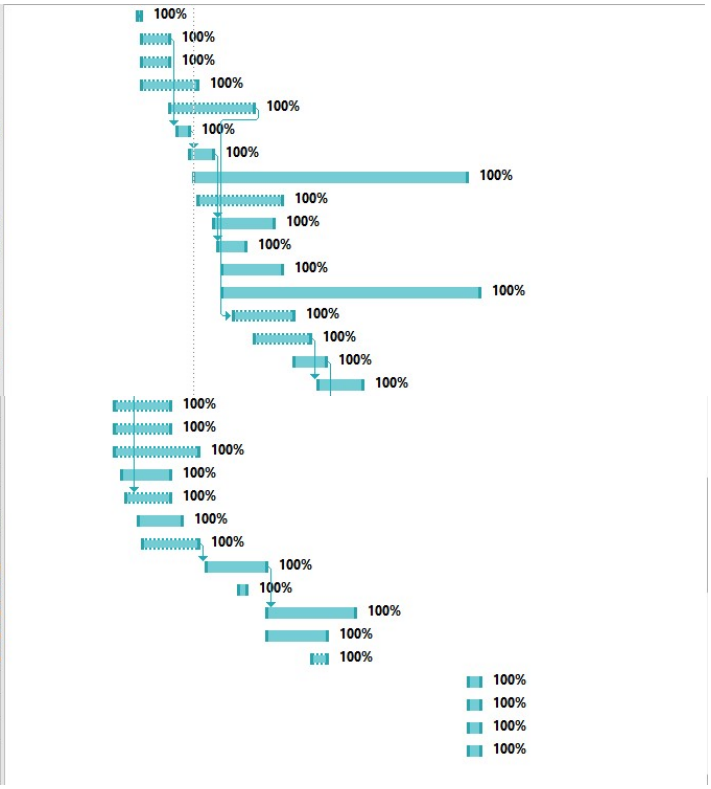
Signature:  Date: 3-8-21

Smart Seat Car Seat

FINAL PROJECT PLAN

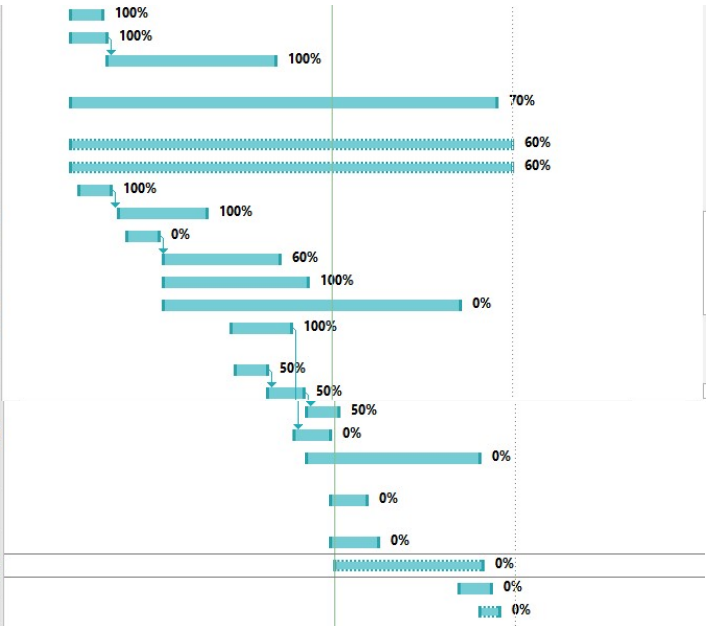
Gantt Chart

Decide communication protocol	1 day	Fri 9/11/20	Fri 9/11/20
Project Proposal	6 days	Sat 9/12/20	Fri 9/18/20
Complete Charter	6 days	Sat 9/12/20	Fri 9/18/20
Complete VOC and Scope	11 days	Sat 9/12/20	Fri 9/25/20
Draft Specifications	16 days	Sat 9/19/20	Fri 10/9/20
Develop new project title/dscrptn	3 days	Mon 9/21/2(	Wed 9/23/20
Complete new charter	4 days	Thu 9/24/20	Tue 9/29/20
Assign Task	48 days	Fri 9/25/20	Tue 12/1/20
Brainstorm Ideas	16 days	Sat 9/26/20	Fri 10/16/20
Finalize Scope of Work	11 days	Wed 9/30/2(	Wed 10/14/2
Project Approval Decision	5 days	Thu 10/1/20	Wed 10/7/20
Tradeoff Analysis	11 days	Fri 10/2/20	Fri 10/16/20
Weekly Progress Report	46 days	Fri 10/2/20	Fri 12/4/20
Evaluate Specifications	11 days	Mon 10/5/2(	Mon 10/19/2
High Level Design	11 days	Sat 10/10/20	Fri 10/23/20
Draft Test Plan	6 days	Tue 10/20/2(	Tue 10/27/20
Update High Level Design	9 days	Mon 10/26/2	Thu 11/5/20
Subsystem Interface Documents	11 days	Sat 10/24/20	Fri 11/6/20
Draft Designs for Subsystems	11 days	Sat 10/24/20	Fri 11/6/20
Design Review	16 days	Sat 10/24/20	Fri 11/13/20
Update Design Tradeoff Analysis	10 days	Mon 10/26/2	Fri 11/6/20
Update Draft Test Plan	9 days	Tue 10/27/2(	Fri 11/6/20
Schedule Design Review	7 days	Fri 10/30/20	Mon 11/9/20
Initial Low Level Design	11 days	Sat 10/31/20	Fri 11/13/20
Revised Low Level Design	11 days	Mon 11/16/2	Mon 11/30/2
Project Design Report	2 days	Tue 11/24/2(	Wed 11/25/2
Final Low Level Design	16 days	Tue 12/1/20	Tue 12/22/20
Oral Presentation	11 days	Tue 12/1/20	Tue 12/15/20
Peer Assessment	3 days	Sat 12/12/20	Tue 12/15/20
Update Gantt Chart (Donte)	3 days	Wed 1/20/21	Fri 1/22/21
Review draft specifications (Diallo)	3 days	Wed 1/20/21	Fri 1/22/21
Finalize Draft Specifications (Evan)	3 days	Wed 1/20/21	Fri 1/22/21
Schedule Weekly Meetings with advisor (Donte)	3 days	Wed 1/20/21	Fri 1/22/21



Smart Seat Car Seat

Order Parts (David G.)	6 days	Wed 1/20/21	Wed 1/27/21
Review and finalize LLD (Evan)	7 days	Wed 1/20/21	Thu 1/28/21
Send email to schedule technical presentation and demo (Diallo)	30 days	Fri 1/29/21	Thu 3/11/21
Meet with project team on a weekly basis (All)	76 days	Wed 1/20/21	Wed 5/5/21
Weekly Progress Report (All)	79 days	Wed 1/20/21	Sun 5/9/21
Weekly meeting with advisor (All)	79 days	Wed 1/20/21	Sun 5/9/21
Review Test Spec. (Donte)	6 days	Fri 1/22/21	Fri 1/29/21
Submit signed test spec. (Donte)	16 days	Mon 2/1/21	Mon 2/22/21
Assemble Project (All)	6 days	Wed 2/3/21	Wed 2/10/21
Complete system testing (All)	21 days	Fri 2/12/21	Fri 3/12/21
Mid Semester Presentation (All)	26 days	Fri 2/12/21	Fri 3/19/21
Report Draft (Evan)	52 days	Fri 2/12/21	Mon 4/26/21
Schedule technical presentation and demo	11 days	Mon 3/1/21	Mon 3/15/21
Conduct Initial system tests (All)	6 days	Tue 3/2/21	Tue 3/9/21
Evaluate initial system test (All)	7 days	Wed 3/10/21	Thu 3/18/21
Demonstrate subsystems to advisor (All)	6 days	Fri 3/19/21	Fri 3/26/21
Final technical presentation (All)	7 days	Tue 3/16/21	Wed 3/24/21
Final Presentation to IAB/Students/Faculty (All)	31 days	Fri 3/19/21	Fri 4/30/21
Teaming assessment on group project (All)	7 days	Thu 3/25/21	Fri 4/2/21
Project Poster Final Version (Diallo)	8 days	Thu 3/25/21	Mon 4/5/21
Final Report (Donte)	27 days	Fri 3/26/21	Sat 5/1/21
Peer assessment on group project (All)	6 days	Mon 4/26/21	Mon 5/3/21
Submit Final paper to Library (All)	4 days	Sat 5/1/21	Wed 5/5/21



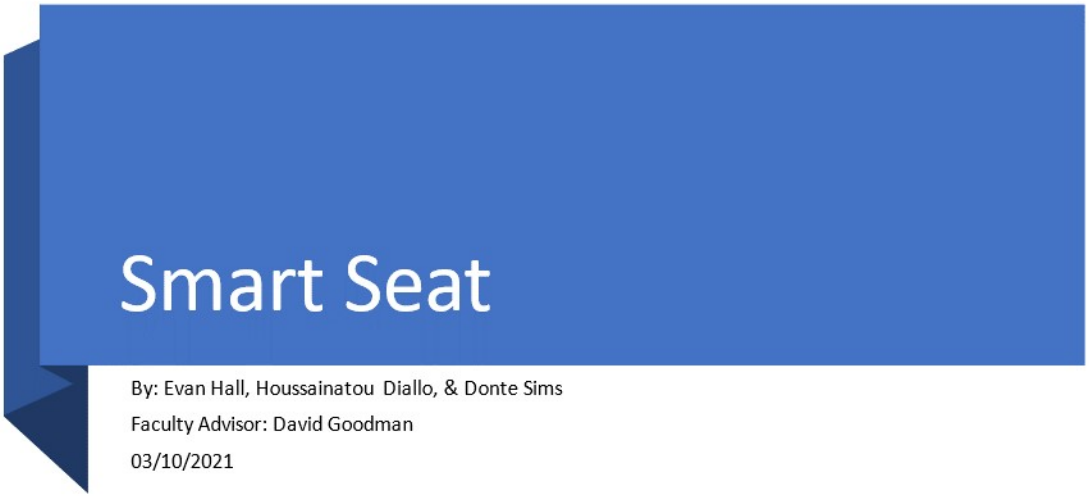
Bill of Materials

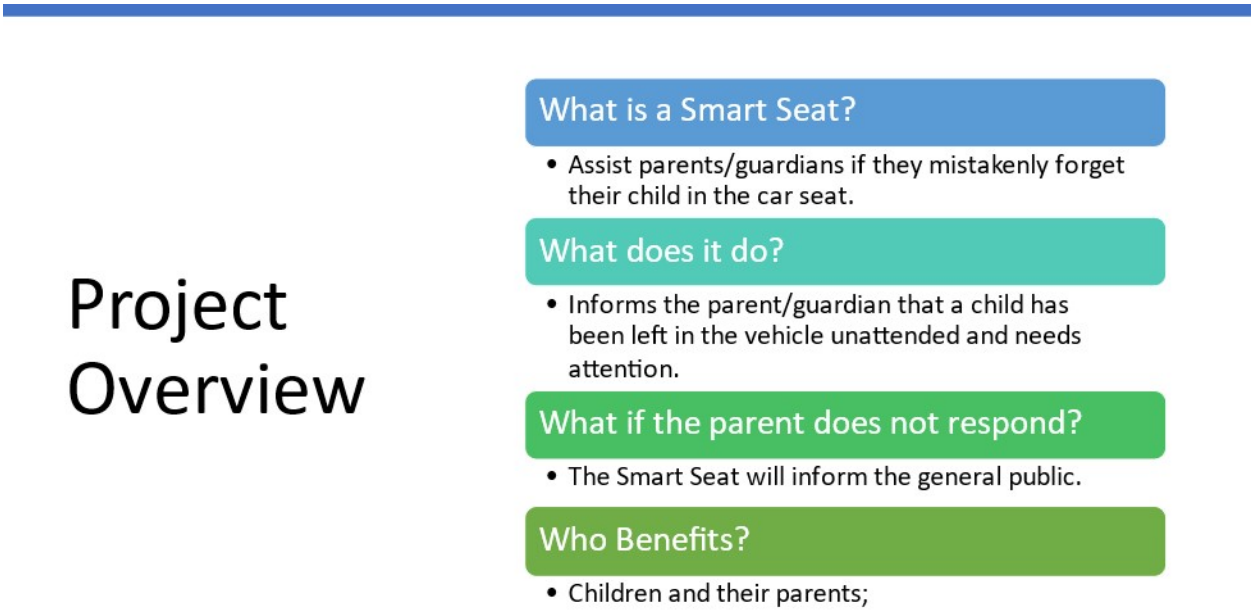
Bill of Materials - Smart Seat Car Seat

ITEM NO.	MFR Name / PART NO.	Part No.	QTY.	DESCRIPTION	COST
1	Velleman	2245415	1	Temperature and Humidity Sensor (FTC Block DHT11)	$ 6.49
2	DT Moto	B075KZJW5Z	1	Strobe Light	$ 18.95
3	Adafruit	4295	1	Raspberry Pi 4 (ALREADY HAVE, DO NOT ORDER)	$ -
4	Pololu	1645	2	Pololu - Force-Sensing Resistor: 1.5" Square	$ 19.90
5	Parallax	2082927	1	PIR Motion Sensor	$ 14.95
6	Judco Manufacturing	22218	1	PUSHBUTTON	$ 1.75
7	IUPUI	N/A	1	18/2 red and black wire (100 ft.)	$ -
8	IUPUI	N/A	1	18/2 white wire (100 ft.)	$ -
9	Cinch Connectors	231036	4	Connector Barrier Strip 8 Postion	$ 17.00
10	Poly Case	DC-59PMMTG	1	Gasketed Heavy Duty Enclosure w/screws	$ 18.01
11	Jameco Valuepro	419160	2	4ft. Of Black 1/8 Inch Polyolefin Heat Shrink Tubing	$ 2.50
12	Ultra Bright Lightz	CLPDP	1	12V male plug cigarette lighter adapter, 10A on/off switch cord w/fuse and 1.5m cable	$ 14.99
13	Konnected		1	12V to 5VDC USB-C buck converter	$ 11.99
14	Automation Direct	AD-SSR6M12-DC-200D	1	3V DC Relay	$ 18.50
15	PicoUps	120-ATV	1	Uinterruptable Power Supply	$ 35.00
16	Mighty Max		1	12V 5A SLA Battery	$ 15.79
17	Graco		1	Car Seat (wil attempt to find one cheaper)	$ 39.99
				TOTAL	$ 235.81
				Taxes	$16.51
				Final Total	$252.32

Smart Seat Car Seat

PRESENTATION SLIDES





Smart Seat Car Seat

Engineering Requirements

- **Temperature Sensor (0C– 50C) [0C-45C]**
  - Interior Vehicle Temperature
- **Occupancy Sensor (15ft – 30ft) [minimum 5ft]**
  - Front Seat Occupancy
- **Force Sensitive Resistor (resistor dependent) [4lbs]**
  - Car Seat Presence
- **Uninterruptable Power Supply**
  - Alternate Power Source

Cost Breakdown

ITEM NO.	MFR Name / PART NO.	Part No.	QTY.	DESCRIPTION	COST
1	Velleman	2245415	1	Temperature and Humidity Sensor (FTC Block DHT11)	$ 6.49
2	DT Moto	B075KZJW5Z	1	Strobe Light	$ 18.95
3	Adafruit	4295	1	Raspberry Pi 4 (ALREADY HAVE, DO NOT ORDER)	$ -
4	Pololu	1645	2	Pololu - Force-Sensing Resistor: 1.5" Square	$ 19.90
5	Parallax	2082927	1	PIR Motion Sensor	$ 14.95
6	Judco Manufacturing	22218	1	PUSHBUTTON	$ 1.75
7	IUPUI	N/A	1	18/2 red and black wire (100 ft.)	$ -
8	IUPUI	N/A	1	18/2 white wire (100 ft.)	$ -
9	Cinch Connectors	231036	4	Connector Barrier Strip 8 Postion	$ 17.00
10	Poly Case	DC-59PMMTG	1	Gasketed Heavy Duty Enclosure w/screws	$ 18.01
11	Jameco Valuepro	419160	2	4ft. Of Black 1/8 Inch Polyolefin Heat Shrink Tubing	$ 2.50
12	Ultra Bright Lightz	CLPDP	1	12V male plug cigarette lighter adapter, 10A on/off switch cord w/fuse and 1.5m cable	$ 14.99
13	Konnected		1	12V to 5VDC USB-C buck converter	$ 11.99
14	Automation Direct	AD-SSR6M12-DC-200D	1	3V DC Relay	$ 18.50
15	PicoUps	120-ATV	1	Uinterruptable Power Supply	$ 35.00
16	Mighty Max		1	12V 5A SLA Battery	$ 15.79
17	Graco		1	Car Seat	$ 39.99
				TOTAL	**$ 235.81**
				Taxes	$16.51
				Final Total	$252.32

-

Smart Seat Car Seat

Alternatives to Raspberry Pi 4

Cellular GSM Module

Microcontroller with GSM Module		
	Cost	
PIC16F877A Microcontroller	$	5.43
Adafruit FONA Mini Cellular GSM Module	$	39.95
Mini GSM Cellular Antenna	$	4.95
GSM Sim Card (Monthly Cost)	$	9.00
Total	$	59.33

BLE Microcontrollers

Bluetooth Options			
Parts		Cost	
Adafruit Feather 32u4 (Everything in One)		$	32.95
	Total	$	32.95
Benefits	Ease of Use with LightBlue app		
Cons	Cost		
OR			
PIC24FJ128GB204 (Microcontroller)		$	4.15
RN4870 (Bluetooth Module)		$	6.11
TEL0010 USB Interface (Allows USB connection		$	9.00
	Total	$	19.26
Benefits	Cheaper than other microcontrollers		
Cons	Hard to use, requires developmental board or usb-c connector.		

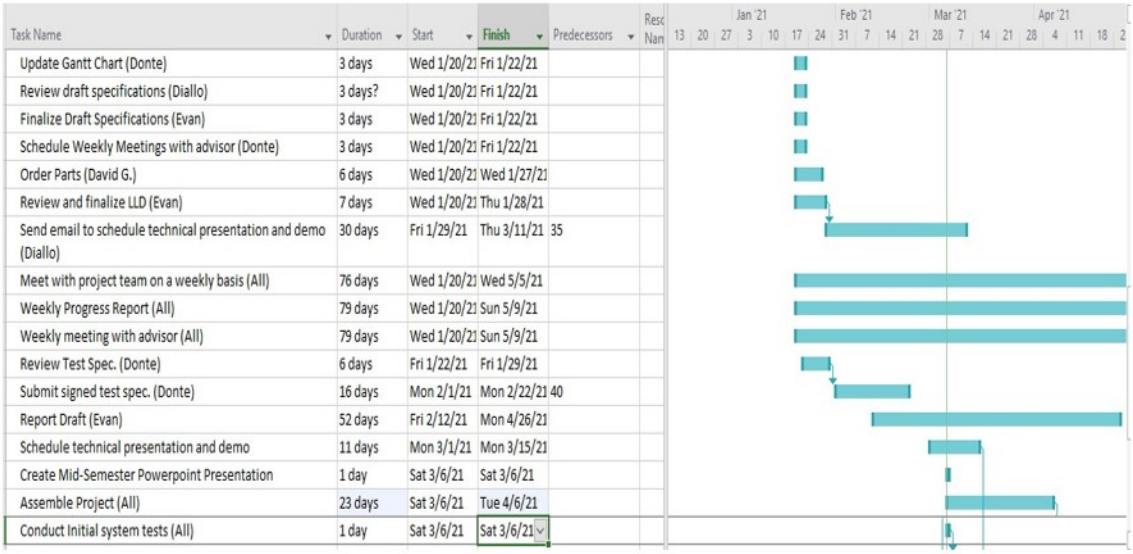
Work Breakdown Structure

- HoussainatouDiallo
  - Data Management
- Evan Hall
  - Programming
- Donte Sims
  - Project Management

**All physical signal wiring from GPIO pins is YELLOW*

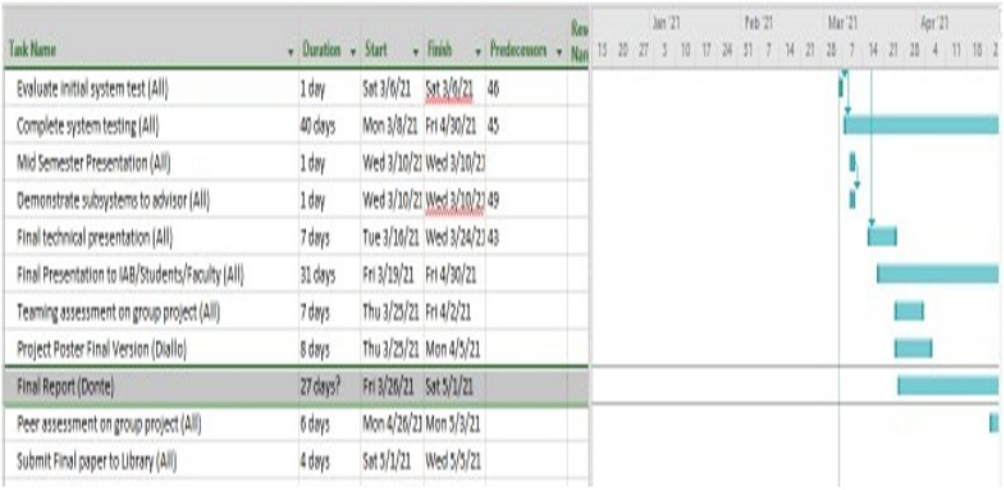
Smart Seat Car Seat

Gantt Chart



Task Name	Duration	Start	Finish	Predecessors
Update Gantt Chart (Donte)	3 days	Wed 1/20/21	Fri 1/22/21	
Review draft specifications (Diallo)	3 days?	Wed 1/20/21	Fri 1/22/21	
Finalize Draft Specifications (Evan)	3 days	Wed 1/20/21	Fri 1/22/21	
Schedule Weekly Meetings with advisor (Donte)	3 days	Wed 1/20/21	Fri 1/22/21	
Order Parts (David G.)	6 days	Wed 1/20/21	Wed 1/27/21	
Review and finalize LLD (Evan)	7 days	Wed 1/20/21	Thu 1/28/21	
Send email to schedule technical presentation and demo (Diallo)	30 days	Fri 1/29/21	Thu 3/11/21	35
Meet with project team on a weekly basis (All)	76 days	Wed 1/20/21	Wed 5/5/21	
Weekly Progress Report (All)	79 days	Wed 1/20/21	Sun 5/9/21	
Weekly meeting with advisor (All)	79 days	Wed 1/20/21	Sun 5/9/21	
Review Test Spec. (Donte)	6 days	Fri 1/22/21	Fri 1/29/21	
Submit signed test spec. (Donte)	16 days	Mon 2/1/21	Mon 2/22/21	40
Report Draft (Evan)	52 days	Fri 2/12/21	Mon 4/26/21	
Schedule technical presentation and demo	11 days	Mon 3/1/21	Mon 3/15/21	
Create Mid-Semester Powerpoint Presentation	1 day	Sat 3/6/21	Sat 3/6/21	
Assemble Project (All)	23 days	Sat 3/6/21	Tue 4/6/21	
Conduct Initial system tests (All)	1 day	Sat 3/6/21	Sat 3/6/21	

Gantt Chart (continued)



Task Name	Duration	Start	Finish	Predecessors
Evaluate initial system test (All)	1 day	Sat 3/6/21	Sat 3/6/21	46
Complete system testing (All)	40 days	Mon 3/8/21	Fri 4/30/21	45
Mid Semester Presentation (All)	1 day	Wed 3/10/21	Wed 3/10/21	
Demonstrate subsystems to advisor (All)	1 day	Wed 3/10/21	Wed 3/10/21	49
Final technical presentation (All)	7 days	Tue 3/16/21	Wed 3/24/21	43
Final Presentation to IAB/Students/Faculty (All)	31 days	Fri 3/19/21	Fri 4/30/21	
Teaming assessment on group project (All)	7 days	Thu 3/25/21	Fri 4/2/21	
Project Poster Final Version (Diallo)	8 days	Thu 3/25/21	Mon 4/5/21	
Final Report (Donte)	27 days?	Fri 3/26/21	Sat 5/1/21	
Peer assessment on group project (All)	6 days	Mon 4/26/21	Mon 5/3/21	
Submit Final paper to Library (All)	4 days	Sat 5/1/21	Wed 5/5/21	

Smart Seat Car Seat

Project Status

- Extended Lead Time on Parts
  - UPS
  - Car Seat
- Coding Complete
- In good standing overall to complete project

Smart Seat Car Seat

Weekly Progress Reports

Name: ___Evan Hall_____
Today's date: __1/23/2021_____
Week Number: _1_____
Total Hours for Week: __3_____

Expected Tasks to be Accomplished This Past Week

Gantt Chart, Team Meeting, Final requirement specifications

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Gantt Chart -1 Team Meeting – 2 Requirement Specifications -1 (Goodman still needs to sign off)

Problems Encountered This Past Week and Impact on Project

Everything is on track but looking at the future parts we may need to order, there might be a tight budget ahead since another thing needs to be added. Everything should be fine, but it will affect our plans

Expectations for Next Week

Weekly meeting and Revised LLD

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 01/29/2021_____
Week Number: 2_____
Total Hours for Week: 4_____

Expected Tasks to be Accomplished This Past Week

Review and finalize LLD (Evan) Send email to schedule technical presentation and demo (Diallo) Meet with team Weekly progress report Review test specifications Begin ordering parts (stephed@iupui.edu) Discuss with Phil Pash microcontroller selection (Evan)

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Review and finalize LLD (Evan) Send email to schedule technical presentation and demo (Diallo) Meet with team Weekly progress report

Problems Encountered This Past Week and Impact on Project

N/A

Expectations for Next Week

Review test specifications Begin ordering parts (stephed@iupui.edu) Discuss with Phil Pash microcontroller selection (Evan)

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 02/05/2021_____
Week Number: 3_____
Total Hours for Week: 3_____

Expected Tasks to be Accomplished This Past Week

- Weekly Meeting
- Review test specifications
- Begin ordering parts (stephed@iupui.edu)
- Discuss with Phil Pash microcontroller selection (Evan)

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

- Weekly Meeting
- Reviewed test specification and submitted to David Goodman for review and signature
- Attempted to have parts ordered

Problems Encountered This Past Week and Impact on Project

- Ran into issue ordering parts as parts should not be ordered from Amazon unless absolutely necessary
- Recognized issues with LLD regarding correct version of BOM and Wiring Diagram

Expectations for Next Week

- Weekly Meeting
- Revise BOM
- Update LLD with up-to-date information
- Order parts

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 02/12/2021_____
Week Number: 4_____
Total Hours for Week: 6_____

Expected Tasks to be Accomplished This Past Week

- Weekly Meeting
- Revise BOM
- Update LLD with up-to-date information
- Order parts

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

- Weekly Meeting
- Revised BOM (Donte)
- Updated LLD with updated information (Evan)
- Ordered Parts (Donte/Craig S.)
- Scheduled Mid-Semester Review (Diallo)

Problems Encountered This Past Week and Impact on Project

N/A

Expectations for Next Week

- Weekly Meeting
- Receive parts to begin assembly
- Begin assembly of project

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 02/19/2021_____
Week Number: 5_____
Total Hours for Week: 5_____

Expected Tasks to be Accomplished This Past Week

Weekly Meeting Receive parts to begin assembly Begin assembly of project

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Weekly Meeting (Team)

Problems Encountered This Past Week and Impact on Project

Parts did not come in. This burns 1 week of time for our build/test of the project.

Expectations for Next Week

Weekly Meeting Receive parts to begin assembly Begin assembly of project

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 02/26/2021_____
Week Number: 6_____
Total Hours for Week: 1_____

Expected Tasks to be Accomplished This Past Week

Weekly Meeting Receive Parts for Project Begin Assembly of Project

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Weekly team meeting Received project parts (excluding car seat and micro-UPS)

Problems Encountered This Past Week and Impact on Project

N/A

Expectations for Next Week

Assemble Project Mid-semester presentation Weekly team meeting

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 03/05/2021_____
Week Number: 7_____
Total Hours for Week: 8.5_____

Expected Tasks to be Accomplished This Past Week

- Assemble Project
- Mid-semester power point presentation
- Weekly team meeting

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

- Weekly team meeting
- Prototyped project to prepare for mid semester presentation
- Power point presentation complete
- Updated Gantt Chart

Problems Encountered This Past Week and Impact on Project

Pending project parts (car seat and micro UPS); unable to complete a full build of project

Expectations for Next Week

Present mid semester presentation
Continue build (make it look pretty)
Begin Final Paper Report

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 03/12/2021_____
Week Number: 8_____
Total Hours for Week: 3.5_____

Expected Tasks to be Accomplished This Past Week

Present mid semester presentation Continue build (make it look pretty) Begin Final Paper Report

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Presented mid semester presentation Had a Baby (6lbs 7oz 20") [Donte] Received micro-UPS (Diallo)

Problems Encountered This Past Week and Impact on Project

Pending project parts (car seat); unable to complete a full build of project

Expectations for Next Week

Begin Final Paper Report (Donte) Update Gannt Chart (Diallo) Continue working on final code (Evan) Weekly Team Meeting

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 03/19/2021_____
Week Number: 9_____
Total Hours for Week: 3.5_____

Expected Tasks to be Accomplished This Past Week

Begin Final Paper Report (Donte) Update Gannt Chart (Diallo) Continue working on final code (Evan) Weekly Team Meeting

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Weekly Team Meeting Code Revisions (Evan) Started Final Report (Donte) Updated Gantt Chart (Diallo) Received Car Seat (Diallo)

Problems Encountered This Past Week and Impact on Project

N/A

Expectations for Next Week

Weekly Team Meeting Continue Work on Final Report Continue Final Build Analyze power consumption

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 03/26/2021_____
Week Number: 10_____
Total Hours for Week: 8_____

Expected Tasks to be Accomplished This Past Week

Weekly Team Meeting Continue Work on Final Report Continue Final Build Analyze power consumption

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Weekly Team Meeting (Team) Final Report Rough Draft Completed (Donte) Continued working on final build (Team)

Problems Encountered This Past Week and Impact on Project

Relay being used is normally closed, code will be written to try and correct the strobe light being active when the system does not call for it.

Expectations for Next Week

Continue final build Weekly team meeting Power Consumption Analysis

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 04/02/2021_____
Week Number: 11_____
Total Hours for Week: 8_____

Expected Tasks to be Accomplished This Past Week

Continue final build
Weekly team meeting
Power Consumption Analysis

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Weekly Team Meeting (Team)
Recorded load currents and voltages (Diallo)
Poster (Diallo)
Continued working on final build (Team)

Problems Encountered This Past Week and Impact on Project

Difficulty getting relay to work slowed progress on final build; issue resolved will continue with final build and assess raspberry pi's ability to provide the correct amount of current for the system

Expectations for Next Week

Continue final build (Team)
Weekly team meeting (Team)
Update code (Evan)
Work on Final Report (Donte)

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 04/09/2021_____
Week Number: 12_____
Total Hours for Week: 8_____

Expected Tasks to be Accomplished This Past Week

Continue final build (Team) Weekly team meeting (Team) Update code (Evan) Work on Final Report (Donte)

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Continued final build (Team) Weekly team meeting (Team) Power Consumption Analysis completed (Diallo) Final presentation started (Diallo) Began testing of project (Team)

Problems Encountered This Past Week and Impact on Project

Expectations for Next Week

Complete final build (Team) [final touches] Weekly team meeting (Team) Update code (Evan) [final touches] Work on Final Report (Donte)

Smart Seat Car Seat

Name: Donte Sims, Evan Hall, Houssaintaou Diallo_____
Today's date: 04/23/2021_____
Week Number: 14_____
Total Hours for Week: 7_____

Expected Tasks to be Accomplished This Past Week

Complete final build [replace fsr sensors] Test system functionality (Evan) Final Presentation (Team) Complete and submit final paper (Donte)

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Complete final build (Team) Final Testing (Test) Weekly team meeting (Team) Update code (Evan) Final Presentation (Team) Completed Final Paper (Donte)

Problems Encountered This Past Week and Impact on Project

N/A

Expectations for Next Week

Final Technical Presentation (Evan) Complete any remaining assignments (Team)

Smart Seat Car Seat

Test Results

STEP	TEST PERFORMED (Y/N)	PASS/FAIL	NOTES
1Power On	Y	PASS	
2 Inputs Working	Y	PASS	
3 Outputs Working?	Y	PASS	
4 LEDs working when conditions are applied?	Y	PASS	Green is for child presence Yellow is for temp sensor working correctly
5 Reset work when lights are flashing?	Y	PASS	Needed to buy another relay because first one required too much current
6 Final Code working?	Y	PASS	File got corrupted so another instance of code had to be made.